

## Vertebrate fauna of *Banksia* woodlands

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*Banksia* woodlands with their floristic richness, extensive flowering regimes, juxtaposition to other vegetation formations and extensive distribution on deep near-coastal sands are important for vertebrates. However, no vertebrate species is unique to *Banksia* woodlands.

### Amphibians

Nine species may occur in *Banksia* woodlands (Davidge 1979, Murray 1980, Bamford 1986, A H Burbidge pers comm, How & Dell unpubl). Most require water for larval development, consequently their entire life cycle cannot occur in *Banksia* woodlands; they are captured throughout the year after rain, but activity peaks in spring (How & Dell unpubl).

The two arboreal hylid species (*Litoria moorei* and *L. adeloidensis*) are seldom found far from water and thus occur as transients and then only peripherally in *Banksia* woodlands. Species of the leptodactylid genera *Heleioporus*, *Limnodynastes*, *Pseudophryne* and *Ranidello* also depend on water, but have the ability to burrow while *H. eyrei* and *L. dorsalis* have been caught in *Banksia* woodlands several kilometres from the nearest water.

The Turtle Frog *Myobatrachus gouldii* has direct development, ie no tadpole stage is involved (Watson & Saunders 1959, Roberts 1981), and is independent of water for its development making it the only species capable of surviving entirely in *Banksia* woodlands.

### Reptiles

Studies of major geographic regions (Kitchener *et al* 1980, McKenzie *et al* 1987) have found that few, if any, reptile species have disappeared since European settlement. The goannas *Varanus gouldii*, *V. rosenbergi* and *V. tristis* have become less numerous in *Banksia* woodlands due to habitat fragmentation and changing resource availability and there are no recent records of the Carpet Python *Morelia spilota*.

Two arboreal geckos, *Diplodactylus spinigerus* and *Phyllodactylus marmoratus* are widespread and abundant, while the terrestrial, *D. polyophthalmus* and *D. ornatus* are infrequently recorded (Davidge 1979, Murray 1980, Bamford 1986). Agamids whose distributions encompass the extent of *Banksia* woodlands (*Pogona minor* and *Tympanocryptis adelaidensis*) are recorded on most sites, however, *Banksia* woodlands occur outside the main geographical distribution of most geckos and agamids.

Skinks are the richest family with 10 genera. The arboreal *Cryptoblepharus plagioccephalus* is widespread and common as are the terrestrial *Ctenotus fallens*, *C. lesueurii*, *Lerista elegans*, *Menetio greyi*, *Morethia obscura*, *M. lineocelloto*, *Tiliqua rugosa* and the fossorial *Leristo proepedito*. Several species in *Banksia* woodlands are near the limits of their range; these include *Ctenotus impar*, *C. schomburgkii*, *Egernio multiuscutoto*, *Leristo christinae*, and the rare *L. lineota*. It is probable that *Leiopismis trilineatum*, *Egernia nopoleonis* and *Omolepida branchiolis* only occupy those woodlands adjacent to denser and moister vegetation types. *Hemiergus quadrilineota* and *Leristo lineopunctuloto*, appear to be more common in woodlands occupying the coastal Spearwood Dune systems.

The blind snake *Ramphotyphlops oustrolis* occurs in many *Banksia* woodlands and elapid snakes are recorded in most *Banksia* woodlands that have been sampled for more than a year. Bamford (1986) recorded *Demonisio reticulato*, *Notechis*

*curtus*, *Rhinoplocephalus gouldii*, *Vermicella calonotus* and *V. bertholdi* at Mooliabeenie while at Bold Park (How & Dell unpubl) *V. bertholdi*, *V. calonotus*, *V. bimaculata*, *V. fasciolata* occur sympatrically with *Pseudonaja affinis*. The diversity of *Vermicella* can be explained by the abundance of fossorial and epigaic lizards which constitute their principal food source.

The composition of the reptile assemblage reflects the sandy substrates of *Banksia* woodlands. Genera that are fossorial (eg *Lerista* and *Vermicella*) are well represented, while those that use burrows (eg *Diplodactylus* and *Egernia*) are poorly represented. Litter inhabiting genera (*Hemiergus*, *Morethia*, *Menetia*) occur in most habitats, although this is correlated with time since fire (Bamford 1986).

In some isolated patches of *Banksia* woodlands extensive weed invasion (Keighery this publ) covers the ground between shrubs. This has severely impinged on reptiles which forage in the open between bushes eg *Tympanocryptis adelaidensis* and *Ctenotus lesueurii*. Dense rooting patterns may also inhibit the movement of near-surface fossorial species.

### Birds

Bird studies have focussed on the importance of *Banksia* species to the maintenance and structuring of both nectar and insect feeding groups and entire assemblages.

Bamford's (1986) detailed study on *Banksia* woodlands of different ages after fire provides the most detailed account of the annual composition of the avifauna. Bamford recorded 86 bird species within his study area at Mooliabeenie; 17 were principally birds of *Banksia* woodlands, 48 occurred in both woodland and adjacent farmland and 21 occurred principally in cleared farmland. Of the 86 species, 19 were migratory or present for only part of the year, 24 were rare or uncommon vagrants, 35 showed marked seasonal variation and 8 slight variation in numbers. The strong seasonality in bird numbers of these *B. menziesii*/*B. attenuato* woodlands resulted principally from migratory species, particularly insectivores, moving in towards the end of spring to make use of increased invertebrate availability.

Honeyeaters showed a bimodal peak in numbers of individuals (Bamford 1986) that corresponded to the peak flowering of *B. attenuata* (Dec.-Jan.) and *B. menziesii* (June-July). Insects are taken by all honeyeater species (Tullis *et al* 1982, Collins 1985) and form an important protein source, while nectar is the principal energy source. Tullis *et al* (1982) indicated the importance of *Banksia* woodlands to honeyeaters in winter, but their study only covered the period April-July. Newland & Wooller (1985) compared nectar feeding and insectivorous honeyeaters and other insectivores in *Banksia littoralis* woodland and adjacent *B. menziesii*/*B. attenuato* woodland. They present important data on the flowering phenologies of *Banksia* and understory species in explaining contrasting richness and abundance in honeyeaters over the year. *B. littoralis* had more species and individuals during the winter, when peak nectar occurred; adjacent woodlands had more constant numbers throughout the year resulting from overlapping flowering times of the dominant species. Large and moderate sized honeyeaters predominated in *B. littoralis* woodland while smaller species dominated in other *Banksia* woodlands.

Migratory insectivores, eg Bronze Cuckoos, Bee-eaters, move into *Banksia* woodlands to take advantage of seasonal peaks in arthropods, while resident insectivores, eg thornbills,

silvereyes, retain relatively constant numbers throughout the year with fluctuations in numbers attributed to recruitment of the young (Newland & Wooller 1985).

Most resident species breed during winter-early spring so that food resources are maximized for nesting and breeding when energetic costs are greatest.

*Banksias* themselves infrequently develop hollows consequently, parrots and cockatoos that are dependent on tree hollows for nesting rely on adjacent eucalypt woodlands, or use hollows in the few emergent eucalypts in *Banksia* woodlands.

Fire in *Banksia* woodlands advantages those species which prefer to forage in open vegetation (Bamford 1986). These are generally colonizing species that can take advantage of modified environments. Small resident species, especially insectivores, are disadvantaged by a loss of the structurally diverse and dense understory species after fire. These birds are generally those that need special conservation measures since they are susceptible to local extinctions after major environmental modifications.

Storr & Johnstone (1988) presented a list of birds of the Swan Coastal Plain and commented on status changes since European settlement. Unlike birds of other associations, such as Tuart forests and woodlands fringing lakes, *Banksia* woodland birds have not declined to the same extent.

### Mammals

Range reductions of mammals since European settlement have been attributed to several causes, principally habitat alteration, changed fire frequency and predation. (Kitchener *et al* 1978, How *et al* 1987). Consequently, the fauna of *Banksia* woodlands has probably changed substantially since European settlement.

The most abundant and widespread mammal in *Banksia* woodlands is the introduced Mouse *Mus domesticus*. Other species that have established feral populations since European settlement and which also occur in *Banksia* woodlands are the Black Rat *Rattus rattus*, Red Fox *Vulpes vulpes*, Ferret *Mustela putorius*, Cat *Felis catus*, and European Rabbit *Oryctolagus cuniculus* (Kitchener *et al* 1978). The Dingo *Canis familiaris*, Tamar *Macropus eugenii*, Quokka *Setonix brachyurus* and Woylie *Bettongia penicillata* may all have used *Banksia* woodlands but are unlikely to maintain viable populations in these habitats.

Of the small native semi-arboreal mammals, the Honey Possum *Tarsipes rostratus* occupies many *Banksia* woodlands, while the Western Pigmy Possum *Cercortetus concinnus* may also occur in woodlands that have remained unburnt for a long period. Small native terrestrial mammals are never abundant in this habitat, although 3 species of dunnart, *Sminthopsis dolichuro*, *S. griseoventer*, *S. granulipes* and the Ashy-grey Mouse, *Pseudomys olbocinereus*, have been recorded in the more northern woodlands (Murray 1980, Bamford 1986).

Little is known of the bats occupying *Banksia* woodlands as no systematic surveys have been done. However, the Lesser Long-eared Bat *Nyctophilus geoffroyi* frequently roosts under the bark of dead *Banksia* trees (Kitchener *et al* 1978). The Echidna *Tochyllossus aculeatus* probably feeds on termites within and adjacent to these woodlands. Similarly, the marsupial carnivore Chuditch *Dosyurus geoffroyi* may have foraged in *Banksia* woodlands and adjacent areas. The Brushtail Possum *Trichosurus vulpeculo* occurs in *Banksias* only where there are emergent eucalypt trees that provide the necessary hollows for dens; there are no records of this possum feeding on *Banksia* flowers, fruit or leaves. The Quenda *Isodon obesulus*, occurs in *Banksia ottenuata*/*B. menziesii* and swamp *Banksia* (*B. littoralis*) woodlands where these surround ephemeral swamps and lakes.

The effect of fire on small mammals in *Banksia* woodlands has been documented by Bamford (1986). Fire coupled with habitat fragmentation, has greatly reduced the range and abundance of most species. Recent work in three isolated *Banksia* woodlands within the metropolitan area show that *Mus domesticus* occurs in all three and *Isodon* in only one (How & Dell unpubl) despite the apparent suitability of these woodlands for other species.

### Conclusions

The vertebrate fauna occupying *Banksia* woodland consists of species that generally have distributions focussed on the south-west of the state with its Mediterranean type climate. The great majority of vertebrates breed in late autumn to early summer and the young become independent when food is most abundant. Several species of reptile are more characteristic of semi-arid and arid parts of the state, and frequent more northern *Banksia* woodlands where the higher temperature and sandy soils are determining factors. Similarly some arid-zone bird species are moving into areas where *Banksia* woodlands occur adjacent to cleared land.

Strong patterns of seasonal abundance are apparent in many species and these result from different causal mechanisms. For highly mobile bird species, numbers fluctuate in response to changing food resources such as nectar or insects. Reptile abundance reflects changes in temperature, while seasonality in amphibians is associated with changing temperature and moisture regimes. Mammals show only slight seasonal patterns that generally reflect recruitment into the population after breeding.

Unlike many eucalypts, *Banksia* trees do not readily form hollows in limbs or trunks, consequently, species such as parrots and Brushtail Possums, which are obligate hollow users, seldom occur exclusively in *Banksia* woodlands. Land clearing and fire have both affected the composition of vertebrate species occupying *Banksia* woodlands. The frequency and time since burning can be shown to have a pronounced effect on species composition; species dependent on vegetation that has been unburnt for long periods have been greatly reduced since European settlement.

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